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Neurological Examination

J. B. Stanton
F.R.C.P.E., F.R.C.P., D.P.M. Neurological Unit, Northern General Hospital.

Abstract
Wilfred Trotter has said that the performance of a refined neurological examination is " a job for men" . Certainly performing a full neurological examination seems to separate the men from the boys and many medical students are often unnecessarily alarmed at the prospect. Much of this anxiety can be dispelled, however, if the logic of the examination is appreciated. A greater number of objective signs can be elicited in the examination of the nervous system than in any other system and this profusion of signs, at first so unnerving, can be a positive advantage in providing sufficiently precise information regarding the site of dysfunction in the nervous system. After the examination has revealed this anatomical diagnosis, the physician, by taking into account the details of the evolution of the disease revealed in the history, can usually reach a final conclusion regarding the nature of the disease which is causing the dysfunction in the nervous system. This is the final or pathological diagnosis.

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NEUROLOGICAL EXAMINATION

The first of two articles written for Res Medica by
J. B. STANTON, F.R.C.P.E., F.R.C.P., D.P.M.,
Neurological Unit, Northern General Hospital.

Wilfred Trotter has said that the performance of a refined neurological examination is "a job for men". Certainly performing a full neurological examination seems to separate the men from the boys and many medical students are often unnecessarily alarmed at the prospect. Much of this anxiety can be dispelled, however, if the logic of the examination is appreciated. A greater number of objective signs can be elicited in the examination of the nervous system than in any other system and this profusion of signs, at first so unnerving, can be a positive advantage in providing sufficiently precise information regarding the site of dysfunction in the nervous system. After the examination has revealed this anatomical diagnosis, the physician, by taking into account the details of the evolution of the disease revealed in the history, can usually reach a final conclusion regarding the nature of the disease which is causing the dysfunction in the nervous system. This is the final or pathological diagnosis.

The following account deals briefly with the correct methods of eliciting the physical signs and is not primarily concerned with neurological history taking. The importance of taking a careful history, however, cannot be over-emphasised, in neurology as in any other branch of medicine. A well-known neurologist has said that if he does not have a pretty shrewd idea of what is wrong with a patient when he puts his pen down at the end of taking the history he probably never will know. Not only does the history reveal important information, but the intelligent use of this information will often direct the neurologist's attention to those parts of the physical examination which are particularly revealing in the patient concerned.

EXAMINATION OF THE CRANIAL NERVES

First cranial nerve. The sense of smell should be tested by the use of various aromatic odours, such as coffee, oil of almonds or peppermint. The method is to occlude one nostril

and to ask the patient to sniff the sample presented through the other nostril. This procedure is repeated on the opposite side. The patient may smell nothing (anosmia), or he may say that he can smell some odour but is unable to identify it (hyposmia), or he may be able to identify the odour correctly, in which case he has certainly got normal olfactory sense. The sense of smell may be lost unilaterally with lesions of the olfactory tract and is not uncommonly lost altogether following head injury.

The second cranial nerve. There are three aspects of the function of the second cranial nerve which have to be tested. These are the visual acuity, the fields of vision and the appearance of the fundus. *Visual acuity* is tested ideally for both far and near vision. At the bedside, however, usually only near vision is tested. To do this the patient covers one eye with his hand and is given the near-vision type card and is requested to read the smallest type that he can see. This is N5 on the standard near-vision test. Each eye is tested separately. *The fields of vision* are tested by confrontation. The examiner faces the patient at a distance of 18″ to 2′. One of the patient's eyes is covered and he is instructed to look at the opposite eye of the examiner. In this way the patient will be looking with, for example, his left eye into the examiner's right eye. The patient is instructed to keep his eye fixed on the examiner's eye and the examiner then proceeds to test the extent of the patient's peripheral field by direct comparison with that of his own eye. A small object such as the head of a hatpin is introduced from the periphery towards the centre until the patient declares that he can see it. This procedure is carried out around the whole circumference of the field of vision and any constriction of the field or sector defect is readily apparent. The method of confrontation can also be used to determine the presence of a central scotoma. In this case the object is held a few degrees outside the line of fixation of the patient's eye and he is asked to say whether the object appears clearer in this position or when it is brought immediately in front of his fixation point. Normally the latter position is, of course, the clearer. *The examination of the fundus* requires the use of the ophthalmoscope and this can only be acquired by considerable practice. The examination of the fundus is, of course, part of the general physical examination, but from the neurological standpoint certain features are especially important. These are (a) the appearance of the disc: This is normally of a pinkish-white colour, paler than that of the surrounding retina, and in the centre of the disc the optic cup can be seen, from which the retinal vessels emerge and run over the disc to reach the periphery of the retina. In optic atrophy the disc is paler than normal, and the edge sharper, and in raised intracranial pressure, papilloedema occurs in which there is marked swelling of the optic disc. Swelling can be suspected when the disc is pinker than normal, and when the optic cup is filled up and when the edges of the disc become blurred as the oedema masks the junction with the surrounding retina. (b) The vessels of the retina: Careful examination may reveal differences in calibre of the arteries, and in the arterio venous ratio, indicating the presence of atheroscelerosis, or may show the presence of arterial or venous thrombosis. (c) The appearance of the retina itself: The presence of haemorrhages or exudates is of importance, since these occur not only in general medical diseases, such as hypertension, renal disease, and diabetes, but will also occur when there is gross raised intracranial pressure with papilloedema. The retina may also show signs of old choroiditis or other inflammatory disease, such as tuberculoma, toxoplasmosis, etc., which may have a bearing on the neurological condition.

Third, fourth and sixth cranial nerves. At this point it is convenient to examine the orbit for the presence or absence of proptosis, as well as testing the integrity of the muscles innervated by the third, fourth and sixth cranial nerves, which also include the levator of the upper lid and the pupil. Proptosis is best detected by examining the patient from behind. Ptosis is usually noted early on meeting the patient and is conveniently measured by the degree to which the upper lid in the normal open-eyed position covers the upper part of the limbus. To examine the ocular movements the patient is first asked to look directly ahead. In this position it is possible to detect any squint, that is to say to detect whether the visual axes appear parallel or not. The patient should then be asked to fix his gaze on the examiner's finger held at a distance of about 2′ from the patient. The finger is then moved with the patient's eyes following it to the extreme positions of lateral gaze to either side and also vertically upwards and downwards. The patient is asked whether he sees double

in any position of the eyes and if he does the direction of gaze which produces maximum separation of the images is determined. At the extremes of gaze, attention should also be paid to the presence of nystagmus.

The pupils: These are normally equal in size and regular in shape. They should constrict to a light stimulus, direct or consensual, and on accommodation/convergence. The light reflex is tested by covering one eye and shining a lighted torch on the other eye. The pupil of the eye so stimulated should contract and remain constricted so long as a light is shone on it. If at the same time the hand covering the other eye is raised, it will be seen the pupil of this eye normally contracts consensually when light is thrown on the other eye. This procedure is carried out on each side. Accommodation/ convergence is tested by asking the patient first to look into the distance and then to look at the observer's finger placed one foot in front of him. The two eyes should converge and the pupils contract when the patient focuses on the finger.

Fifth cranial nerve. The sensory, motor and reflex functions of this nerve must be tested. Sensation to light touch and pin prick is examined in the territory of the three divisions of the nerve. Motor function of the muscles of mastication, the masseters, temporales and pterygoids, is also tested. This is done by asking the patient to open or close the jaw against resistance. If the muscles of mastication are paralysed on one side, the jaw will deviate towards that side when opening. The reflexes of the trigeminal nerve are the corneal reflex, which is tested by lightly applying a wisp of cotton wool to the cornea, and the jaw jerk which is the tendon reflex of the muscles of mastication. The patient is asked to open his jaw half-way and the jaw is grasped between the thumb and forefinger of the examiner's hand. A blow with the patella hammer on the examiner's thumb will then elicit the jaw jerk.

The seventh cranial nerve innervates the muscles of the face. It also carries the sensation of taste from the anterior two-thirds of the tongue through the chorda tympani nerve. The facial muscles are tested by asking the patient to wrinkle his forehead, to frown, to screw his eyes up tight, to smile and to whistle. In upper motor neurone weakness the movements of the lower part of the face only are involved, but in a lower motor neurone palsy the whole of the musculature on the affected side is paralysed. *Taste* is a relatively crude sensation and comprises the distinction of sweet, sour, salt and bitter. Other more delicate flavours which we loosely call taste are in fact the properties of the first cranial nerve. Taste on the tongue is tested by applying a small amount of sugar, citric acid, salt or quinine with an applicator stick to the protruded tongue, the patient being asked to identify the taste without withdrawing his tongue into his mouth. He should be instructed to raise his finger to indicate when he has appreciated the taste. He can then be allowed to withdraw his tongue and to announce what he tasted.

Eighth cranial nerve. Hearing is tested at the bedside by the distance at which the patient can hear the whispered voice while one ear is occluded. Normally the distance should be over three feet. If there is depression of hearing of one or both ears then the tuning fork tests should be carried out. There are two of these tests: 1) Rinné's test consists of a comparison of bone and air conduction of sound. The vibrating tuning fork is placed against the mastoid process and the patient asked to say as soon as he can no longer hear the note. The tuning fork is then removed and the vibrating end presented close to the external auditory meatus when, if air conduction is (as normally) better than bone conduction, the patient will again hear the note. This procedure is carried out on each side. (2) Weber's test is performed by placing the vibrating tuning fork on the midline of the head either at the forehead or the vertex and asking the patient whether he hears the sound. With normal hearing the sound is described as in the middle of the head or all over the head, but when there is impaired hearing the sound may be localised to one side. If the deafness is associated with depressed air conduction and Weber's test is lateralised to the same side, this indicates a middle-ear deafness. If in the deaf ear air conduction is better than bone conduction, while both are depressed, and Weber's test is lateralised to the normal ear, then the deafness is caused by nerve deafness.

The ninth and tenth cranial nerves innervate the soft palate and the muscles of the pharynx and larynx. The ninth nerve also carries the

sensation of taste for the posterior third of the tongue. The function of these two nerves can be tested by observing the movements of the palate when the patient says 'Ah', and by eliciting palatal and pharyngeal reflexes. Touching the soft palate with an applicator stick causes a brisk contraction with elevation of the palate, and touching the posterior pharyngeal wall causes gagging with contraction of the wall of the pharynx. If there is paralysis of one side of the palate or pharynx then these movements will be assymmetrical, the movement appearing only on the normal side. Taste over the posterior third of the tongue is tested as described under the facial nerve.

The eleventh cranial nerve innervates the sterno-mastoid and the upper part of the trapezius muscles. The sterno-mastoid is tested by asking the patient to turn his head to the opposite side against resistance when the contracting muscle can be seen and its power estimated. The trapezius is tested by asking the patient to shrug his shoulders upwards towards his ears, while the examiner presses down on the shoulders to assess the power.

The twelfth cranial nerve, the hypoglossal, innervates the tongue. The tongue should first be inspected for any muscle atrophy, fibrillation or tremor. The patient should then be asked to protrude his tongue which normally protrudes in the midline. If there is paralysis of one side then the tongue will deviate towards that side. If this paralysis is of upper motor neurone type, there will be no wasting of the tongue. If it is of lower motor neurone origin, there will be atrophy and possibly fibrillation of the paralysed side.

(To be continued)